

## TRAUMATIC RUPTURE OF THE SPLEEN.<sup>1</sup>

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RUPTURES of the spleen, without external signs of injury, are more frequent than those due to gunshot or stab wounds. Edler found in 160 cases 51.8 per cent. were due to external violence without local signs, 26.2 per cent. were gunshot wounds, and 21.8 per cent. were stab wounds. Pathological spleens are more prone to rupture, even when the trauma is comparatively slight, than normal ones. Of 131 cases of splenic rupture collected by Lewerenz, 82 occurred in pathological organs. Of this entire number the injury was severe in only eighty, slight in fifty, and absent in five. It is a well-known fact that rupture of the spleen is very apt to occur in tropical countries. One observer noted over twenty cases where the spleen had been previously enlarged by malaria.

*Surgical Anatomy.*—The spleen lies quite deeply in the left hypochondriac region. Its posterior end extends almost to the spinal column at the level of the tenth dorsal vertebra; its anterior or lower end extends as far forward as the costoclavicular line (junction of the left sternoclavicular articulation and tip of the eleventh rib). Its outer convex surface lies against the side of the thorax from the ninth to the eleventh ribs, being separated from them only by the diaphragm and the lower border of the left lower lobe of the lung. Its inner surface is in contact with the upper pole of the left kidney and the fundus of the stomach. It is also in contact with the tail of the pancreas at the hilus. It is suspended principally by a ligament which extends from the diaphragm to the colon (phrenocolic); it is also connected with the

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stomach and kidney by folds of the peritoneum. All of these give it but little fixation. The splenic artery and veins enter the organ at the hilus, which is directed towards the median line, and are its sole blood supply. They run along the upper border of the pancreas between the two layers of the gastro-splenic ligaments. The best incision for the removal of the spleen is one through the outer border of the left rectus muscle, beginning at the costal arch.

*Frequency and Manner of Injury.*—From the well protected position of the spleen behind the ribs, one would scarcely expect it to be frequently injured. But this is not borne out by clinical observations. In 292 cases of injuries of varying degrees of severity of the abdominal viscera, Makins found eighty-nine cases of rupture of the viscera. The largest number were those of the kidney (39 per cent.); next were those of the liver (23.59 per cent.), and third, those of the spleen.

The variety of trauma producing rupture of the spleen varies greatly, but may in general be described as due either to a localized force (*e.g.*, a horse-kick, or striking the splenic region with some blunt instrument, as a hammer), or to some force which crushes the thorax and abdomen in an antero-posterior or lateral direction (caught between cars or being run over). The former group is far more frequently the mode of production of the injury than the latter. It may occur at any age and in both sexes, showing that the greater elasticity of the lower ribs in youth plays no rôle. In fifty-three cases in which I could ascertain the cause, a fall upon some object or being struck or kicked was more often the cause than a crushing force (run over), the former in forty-two, the latter in eleven cases.

*Symptoms.*—The symptoms of a rupture of the spleen vary somewhat in different cases, but correspond in general to those of a grave abdominal injury. In the cases which I have collected, in almost every case there were certain more or less pathognomonic symptoms. *First*, severe pain most frequently referred to the left hypochondriac region. *Second*, sooner or later signs of internal hæmorrhage or of collapse.

It is true that there are exceptional cases in which there is but little change at first, the signs of hæmorrhage coming on rather late (in one case on the fourth day). Such hæmorrhage may come on late as the result of dislodgement of the clot. *Third*, one of the most characteristic symptoms is dulness in the flanks, especially on the left side, changing with change of position. *Fourth*, some French surgeons and Trendelenburg have laid great stress upon rigidity of the abdominal muscles upon the side of injury as a valuable sign of rupture of one of the abdominal viscera. It may be said in general, that when a patient has met with either a circumscribed or diffuse mode of injury, and has recovered from the primary symptoms of shock, but continues to have the symptoms of internal hæmorrhage and localized pain, and does not recover from the same within six to twelve hours, a diagnosis of an injury of the spleen or liver, or rupture of the kidney, with hæmorrhage into the peritoneal cavity, may be made. It is almost impossible to differentiate between hæmorrhage from a rupture of the spleen and liver or those intraperitoneal hæmorrhages due to the free communication between the seat of rupture in a lacerated kidney and the general peritoneal cavity.

The following case will serve to illustrate the subject:

J. Z., aged ten years, was brought to the Cook County Hospital at 4 P.M., and admitted to the service of my colleague, Dr. A. P. Heineck. Two hours before admission, a monkey-wrench had been thrown at him during a quarrel, striking him in the left hypochondriac region. He fainted, but recovered consciousness within a few moments, and was able to stand until shortly before he was brought to the hospital. I did not see him upon admission, but responded to a call, in the absence of Dr. Heineck, about nine hours after the injury. His pulse was 96, full and regular; there were extreme pallor, restlessness, and thirst. The abdomen was slightly tympanitic; distinct dulness in the flanks, especially on the left side, changing slightly with change of position. A laparotomy was performed immediately, and upon opening the peritoneal cavity an enormous quantity of clotted and fresh fluid blood escaped. The incision was made over the left

border of the left rectus, which at once exposed the spleen, and an extensive tear was found traversing its entire lower border, from which there was free hæmorrhage. There was also a tear in the omentum. I attempted to suture this tear, but on account of the friability of the tissues my sutures would not hold. The spleen was then extirpated without difficulty. The patient seemed to do well for two days after the operation, and the anæmia began to decrease gradually. He died on the third day. The coroner informed me that the cause of death was a septic peritonitis, but that there had been no further hæmorrhage.

*Prognosis.*—The prognosis in general of rupture of the spleen, without operative interference, is bad. In 101 fatal cases collected by Lewerenz, out of 135 cases of rupture of the spleen, hæmorrhage was the cause of death in 85 per cent. within twenty-four hours. I have collected fifty cases of laparotomy for rupture of the spleen, of which twenty-eight recovered and twenty-one died. Of these cases, the time intervening before the operation is not given in a number. In the remainder, seven were operated upon within six hours, five within twelve, five within twenty-four, and one within thirty-six hours. Three cases were operated upon on the fifth, eighth, and eleventh days respectively. Of the cases which were operated upon and died, seven were operated upon within six hours of the injury, and of these three died of acute anæmia, and one of pneumonia; two were operated on within twelve hours after the injury, one died of peritonitis, the other of anæmia. Four were operated upon within twenty-four hours, one died of delirium tremens complicated by peritonitis, the other of shock, and two of peritonitis. Two operated on within thirty-six hours after the injury, one already had peritonitis, and one died of anæmia. Two operated on within forty-eight hours died of extensive peritonitis and anæmia respectively. One operated upon on the fifth day died of septic peritonitis. Taking all of these latter into consideration, it will be seen that the prognosis can be greatly improved if the cases are operated upon within six to twelve hours after the injury.

It is interesting to note that of the cases which recovered, twenty-seven of the twenty-eight were operated on since 1895, and of those which died, thirteen. It may be said, in general, that the earlier the diagnosis is made the better the prognosis. I do not deny that there are cases which recover spontaneously, but they are rare; and, although the patient may recover from the immediate effects of the hæmorrhage, there is great danger of sepsis later.

In order to demonstrate how operative measures have improved the mortality, it is interesting to study the cases which have been reported up to the present time. Up to 1890, three cases were operated upon, all of which died. From 1890 to 1900, thirty-four cases were operated upon; of these twenty recovered (58 per cent.) and fourteen died (41.2 per cent.). From 1890 to the present time (1902), fifty-three cases were operated upon, of which twenty-eight recovered (52.8 per cent.) and twenty-one died.

*Treatment.*—The treatment should always be operative, either splenectomy, suture, or tampon. It has been found that the removal of the normal spleen causes but slight, if any, changes in the organism. There is occasionally a little glandular swelling and a moderate anæmia.

The experience which I had in my case demonstrated that it is almost impossible to suture a laceration of any extent, so that one must resort either to tamponing the tear or to the removal of the spleen. It is advisable to tampon if the tear is located on the convex surface or one of the borders and does not extend very deeply into the parenchyma, but is contraindicated if the tear is either deep at this place, or there is extensive pulpification of the spleen, or, lastly, if the tear involves the hilus of the organ. Under these conditions, it is far safer to perform splenectomy. At the time of operation one should have a clear conception of whether the force was circumscribed or diffuse, and an effort at a fairly accurate diagnosis of the viscus injured must have been made by the operator before opening the abdomen.

When the abdomen is opened and reveals an extensive intraperitoneal hæmorrhage, the chief sources of this—liver, spleen, and kidney—must be looked for in the order named. Digital compression of the splenic vessels will check the hæmorrhage temporarily until the location of the tear and mode of procedure can be decided upon.